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PROCESS OF TREATING A FABRIC BY GENERATING HEAT

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Luigi (NMN) PACE

Melanie (NMN) FAURE-TROMEUR

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Technical Field

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The present invention relates to a process of treating a fabric, in particular a carpet, using two separate compositions. More particularly, the present invention relates to a process of treating a fabric using two separate compositions whereby heat is generated on the carpet upon contact of said two compositions.

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Background of the Invention

Carpets produced from synthetic or natural fibers and mixtures thereof are commonly used in residential and commercial applications as a floor covering. Various types of fibers can be used in making carpets such as polyamide fibers, polyester fibers as well as wool, cotton or even silk in the case of rugs.

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However, carpets irrespective of whether they are made from natural or synthetic fibers are all prone to soiling and staining. Foods, grease, oils, beverages in particular such as coffee, tea and soft drinks especially those containing acidic dyes can cause unsightly, often dark stains on carpets ("spot stains"). Also fibers may become soiled as a result of dirt particles, clay, dust, i.e., particulate soils in

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general, which may come into contact with and adhere to the fibers of the carpet. These latter soils often appear in the form of a diffuse layer of soils rather than in the form of spots and tend to accumulate particularly in the so called "high traffic areas" such as near doors as a result of intensive use of the carpets in such areas.

Compositions for treating and/or cleaning carpets are already known in the art. Indeed, such carpet treatment compositions can be formulated either as solid or liquid compositions. Solid carpet cleaning compositions to be scattered over a soiled carpet are, for example, disclosed in US 4,659,494 or DE-OS-4411047. Liquid carpet cleaning compositions may be provided either in the form of a sprayable composition, as for example described in WO 96/15308, or in the form of shampoos to be used in spray extraction devices, as for example, described in WO 92/15662. Furthermore, water can be used to clean carpets.

The currently known carpet treaters and/or cleaners as described above, usually show an acceptable performance on removing particulate soils appearing in the form of a diffuse layer of soils as well as on removing light spot stains.

However, it is well known from consumer research that the carpet cleaning performance of compositions used to treat carpets may still be further improved. In particular, the spot stain removal performance of compositions used to treat carpets on any kind of stubborn spot stains, as for example proteinic spot stains, greasy spot stains, bleachable spot stains as well as particulate spot stains, and the soil removal performance of said compositions on soiling of so called "high traffic areas", may still be further improved.

It is therefore an objective of the present invention to provide a process of treating a carpet with a carpet treatment composition that delivers good overall carpet cleaning performance. In particular, it is an objective of the present invention to provide a process of treating a carpet with a carpet treatment composition that delivers good spot stain removal performance on various types of stains including proteinic, greasy, bleachable and/or particulate spot stains as well as good soil removal performance, especially for soiling of so called "high traffic areas".

It has now been found that the above objectives can be met by a process of treating a fabric, and in particular a carpet, according to the present invention.

5 An advantage of the process as described herein is that said process provides an effective way of treating a carpet.

10 Another advantage of the process as described herein, is that said process provides the means to selectively apply a high performance spot stain and soil removal method on heavily stained and/or soiled parts of a fabric, preferably carpet, and apply a normal performing spot stain and soil removal method on normally stained and/or soiled parts of a fabric, preferably carpet.

15 Still a further advantage of the present invention is that the process of treating a carpet herein is applicable to all carpet types, especially delicate natural fibers, and are also safe to most of the carpet dye types, even those particularly sensitive natural dyes used therein. The present invention is also suitable to be used to treat upholstery and car seats covering.

20 Summary of the Invention

The present invention encompasses a process of treating a fabric comprising the steps of applying, in any order, to said fabric a first and a second composition, wherein upon contact of said two compositions heat is generated.

25 In a preferred embodiment the process according to the present invention is a process of treating a carpet.

30 In another preferred embodiment one of said compositions is a solid composition and the other of said two compositions is a liquid composition, preferably the other of said two compositions is a conventional carpet treatment/cleaning composition or water.

35 In still another preferred embodiment according to the present invention the heat generation takes place upon the fabric ("in-situ heat generation").

Detailed Description of the Invention

The present invention encompasses a process of treating a fabric comprising the steps of applying, in any order given, to said fabric a first and a second composition, wherein upon contact of said two compositions heat is generated.

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According to the present invention the process herein may be used for the treatment of any kind of fabrics. Preferably, the process according to the present invention is used to treat carpets or hard wearing textiles and fabrics, e.g., upholstery, rugs, curtains. More preferably, the process according to the present invention is used to treat carpets. The process according to the present invention may be used for the removal of stains and soils as well as of odors from fabrics, preferably carpets. In addition the process according to the present invention may be used to hygienise, disinfect and/or exterminate microinsects from fabrics, preferably carpets.

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The compositions and application of said compositions

The first and/or second composition used in the process according to the present invention may each independently be in its liquid or solid form. Indeed, when said first and/or second composition is in its liquid form, it may each independently be : an aqueous or non-aqueous liquid composition; a thickened or non-thickened liquid composition; a sprayable liquid composition; a foaming or non-foaming liquid composition and/or a pasteous composition. In the case, that said first and/or second composition is in its solid form, it may each independently be in the form of : a powder composition, preferably a scatterable powder composition; a granular composition; or even in the form of a tablet, preferably of compressed powder and/or granular solid composition.

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Depending on their solid or liquid state, said first and/or second compositions may be applied onto the fabric in any way known to those skilled in the art, preferably by spraying, pouring, scattering and the like said first and/or second compositions onto the fabric.

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In a preferred embodiment according to the present invention, one of said compositions is a solid composition. Preferably, one of said compositions is

provided in the form of a powder. More preferably, one of said compositions is a scatterable powder.

In a preferred embodiment according to the present invention, one of said compositions is a conventional liquid or solid carpet treatment composition or water. More preferably, one of said compositions is a conventional liquid carpet treatment composition or water. Suitable conventional liquid carpet treatment compositions may be sprayable, foaming or non-foaming liquid carpet treatment compositions dispensed using a manually- or electrically-operated spraying device or a pressurized spraying device (aerosol can, pressurizer or carbonater). It is in this preferred embodiment wherein the advantage of providing the means to selectively apply a high performance spot stain and soil removal method on heavily stained and/or soiled parts of a fabric, preferably carpet, and apply a normal performing spot stain and soil removal method on normally stained and/or soiled parts of a fabric, preferably carpet is especially noteworthy.

By "conventional liquid or solid carpet treatment composition" it is meant herein, a carpet treatment composition currently available on the market. Preferably, said carpet treatment composition comprises at least one ingredient selected from the group consisting of surfactants, builders, enzymes, solvents and bleaches. Suitable conventional liquid or solid carpet treatment composition are for example Resolve liquid®, 1001 liquid®, Resolve powder® and Capture powder®.

In a highly preferred embodiment according to the present invention, one of said compositions is a scatterable solid powder composition and the other of said two compositions is a conventional liquid carpet treatment composition or water.

In another embodiment according to the present invention, further compositions, liquid or solid, may be applied onto said fabric before, during or after the step of applying said first and second composition onto the fabric.

In a preferred embodiment according to the present invention, said process comprises the steps of applying said compositions to parts, preferably heavily soiled parts of the carpet, e.g., high traffic areas, or spot stains, and optionally mechanically agitating the compositions, preferably with an implement, into the soiled parts of the fabric, preferably carpet layer. Any number of implements may

be used to provide said mechanical agitation, including brushes, sponges, paper towels, a piece of fabric, a cleaning glove, a human finger and the like. Said mechanical agitation allows the compositions to better penetrate into the fabric, preferably carpet, fibers and thus improves the chemical cleaning action of said compositions. In addition, said contact loosens the dirt particles forming the stain.

In another preferred embodiment according to the present invention, said process of treating a fabric, preferably carpet, further comprises the step of at least partially removing said compositions, even more preferably, said process of treating a fabric, preferably carpet, further comprises the step of at least partially removing said compositions in combination with soil particles. Most preferably, the process herein comprises the additional step of leaving the compositions to act on the fabric, preferably for 1 to 60 minutes, before the step of at least partially removing said compositions, preferably at least partially removing said compositions in combination with soil particles. The compositions and the soil particles, if any, from a carpet may be carried out with the help of any commercially available vacuum cleaner like for instance a standard Hoover® 1300W vacuuming machine.

20 Heat generation

Said first and second composition generate heat upon contact of said two compositions. Any kind of compositions capable of generating heat upon contact with each other known to those skilled in the art can be used in the process according to the present invention.

The heat generation is preferably achieved by a binary heat generation system. By "binary heat generation system" it is meant herein that the combination of two or more compounds creates heat by an "exothermic process" either of chemical or physical nature. In a preferred embodiment herein, said first composition comprises a first compound of a binary heat generating system and said second composition comprises a second compound of a binary heat generating system.

By "exothermic process" it is meant herein any process, for example a chemical reaction or a physical state change, involving two or more compounds wherein energy is released at least partially in the form of heat, this means that the

temperature of said compounds and/or the surrounding area of the process is increased.

- 5 Preferably, the compounds ("first compound(s) and second compounds(s)") of said binary heat generation system have to be either physically separated from each prior to the time when the heat generation is needed or in the specific case wherein the exothermic process is a non-spontaneous exothermic chemical reaction that needs to be activated, the activator of said non-spontaneous exothermic chemical reaction has to be separated, preferably physically
- 10 separated, from said compounds. The physical separation may be achieved by including the first compound(s) of the binary heat generation system in one of the compositions herein and the second compound(s) of the binary heat generation system in the other of the two compositions herein, or in the specific case wherein the exothermic process is a non-spontaneous exothermic chemical
- 15 reaction that needs to be activated, the physical separation is achieved by including the activator of the binary heat generation system in one of the compositions herein and the first and the second compound(s) of the binary heat generation system in the other of the two compositions herein.
- 20 In a preferred embodiment according to the present invention, the heat generation takes place upon the fabric ("in-situ heat generation").

- The generation of heat is known to significantly increase the cleaning performance of compositions used to treat fabrics and carpets in particular. This
- 25 finding is based on the fact that the kinetics of chemical reactions involved in the removal of stains and/or soils are significantly accelerated when the temperature of the environment of such a chemical reaction is increased. It is general common knowledge that an increase of approximately 10° C leads to about a two-fold increase in the kinetics of a chemical reaction. Furthermore, the physical
- 30 interaction between compositions and stains and/or soils are improved at elevated temperatures. Indeed, it is a generally known concept to improve the cleaning and/or soil removal performance of water by increasing its temperature.

- The Applicant has now found an efficient way of generating heat directly upon a
- 35 fabric, preferably a carpet. Indeed, it has surprisingly been found that the generation of heat upon contact of said first and second composition, as

described herein, is capable of significantly increasing the cleaning performance provided by said first and/or second composition ("fabric, preferably carpet, cleaning performance benefit"). The generation of heat using two separate compositions, this means said first and said second compositions described herein, provides a means to significantly increase the soil and/or stain removal performance on heavily soiled (soiled high traffic areas) and/or stained (stubborn spot stains, preferably on stubborn proteinic, greasy, bleachable and/or particulate spot stains) areas of the carpet. Furthermore, the heat generation can be locally limited to areas that need a special treatment due to heavy soiling or presence of spot stains. However, it is also possible to generate the heat over a large area of the fabric to be treated or over the whole fabric to be treated.

By "high traffic areas" it is meant herein, areas with an intensive use of the carpets in such areas as for example near doors.

By "particulate stains" it is meant herein, any soils or stains of particulate nature that can be found on any carpet, e.g. clay, dirt, dust, mud, concrete and the like.

By "greasy/oily stains" it is meant herein, any soils or stains of greasy/oily nature that can be found on any carpet, e.g., make-up, lipstick, dirty motor oil and mineral oil, greasy food like mayonnaise, spaghetti sauce and shoe polish.

By "proteinic stains" it is meant herein, any soils or stains of proteinic nature that can be found on any carpet, e.g., grass, urine and blood stains.

Moreover, the Applicant has found that the process herein provides an easy to use way of in-situ generating heat directly on a fabric, preferably a carpet. Indeed, as long as the two compositions herein are stored separately from each other, for example in separate containers or at least compartments of the same container separated from each other by any means suitable, or in the specific case wherein the exothermic process is a non-spontaneous exothermic chemical reaction that needs to be activated by an activator, as long as said activator and the two compositions herein are stored separately from each other, the heat generation can easily be achieved by combining the two compositions on the area to be treated.

The present invention further encompasses the use of a first and a second composition wherein upon contact of said two compositions heat is generated, to treat a fabric, preferably a carpet, whereby a fabric cleaning performance benefit, preferably a carpet cleaning benefit, is provided.

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In the preferred embodiment herein, wherein one of said compositions is a conventional carpet cleaning composition or water, the other of said two compositions is either only the carrier of one of the compounds of the binary heat generation system or may comprise in addition to one of the compounds of the binary heat generation system an active cleaning ingredient. Said active cleaning ingredient may be selected from the group consisting of surfactants, builders, enzymes, solvents and bleaches and mixtures thereof. It is obvious, that the conventional carpet cleaning composition comprises the second part of the binary heat generation system or in the case wherein said second composition is water, water has to be said second part of the binary heat generation system.

In a preferred embodiment according to the present invention, the heat generated (ΔT) upon contact of the two compositions is at least, with increasing preference in the order given, 1° C, 2° C, 3° C, 4° C, 5° C, 10° C, 15° C, 20° C, 30° C or 40° C when measured upon the fabric, preferably carpet.

In another preferred embodiment according to the present invention, the heat generated (ΔT) upon contact of the two compositions is at least, with increasing preference in the order given, 1° C, 2° C, 3° C, 4° C, 5° C, 10° C, 15° C, 20° C, 30° C or 40° C when measured in a glass container.

The heat generation of the two compositions used in the process according to the present invention can be assessed by the following test method : Using an infra-red camera, for instance the AGEMA 570® commercially available from FSI Flir System, the initial temperature of a portion, preferably a 5 cm times 5 cm sized portion, of a carpet is measured. Following this initial measurement, the two compositions according to the present invention are applied onto said portion of the carpet and the temperature measurement using the same infra-red camera is performed again, preferably every 5 seconds for at least 10 minutes, more preferably 5 minutes, ("set of temperature measurements"). The difference between the initial temperature and the temperature, preferably the highest

temperature measured in the set of temperature measurements, on the carpet after the application of said two compositions is the heat generated upon the carpet (ΔT). Typically, the measurement is performed at room temperature (24° C) with the two compositions, prior to their combination, being stored at room temperature for one day and therefore having a temperature of approximately 24° C.

Alternatively, the heat generation can be assessed by combining the two compositions herein in a glass container and measure the temperature change between the two compositions prior to their combination and after their combination using a thermometer. The heat generated (ΔT) of the two compositions is the difference between the initial temperature of the two compositions prior to their combination and the highest temperature measured after their combination. Preferably, the temperature measurement is performed for at least 10 minutes, more preferably 5 minutes. Typically, the measurement is performed at room temperature (24° C) with the two compositions, prior to their combination, the glass container and the thermometer being stored at room temperature for one day and therefore having a temperature of approximately 24° C.

Suitable binary heat generation systems comprise compounds that are part of an exothermic processes either of chemical or physical nature. Preferably, the binary heat generation systems comprise compounds that are part of an exothermic processes either of chemical or physical nature selected from the group consisting of : dissolution of organic or inorganic salts; oxidations or reductions; hydration of substantially anhydrous compounds; and acid/base reactions; and mixtures thereof.

Heat generation by the dissolution of organic or inorganic salts may be achieved by solubilizing organic or inorganic salts in a suitable solvent.

The first compound(s) in this binary heat generation system may be selected from the group consisting of : organic and inorganic salts and mixtures thereof. Preferably, said organic salts are selected from the group consisting of : salts of alkylamines; salts of alkylphosphates; and salts of alkylammoniums; and mixtures thereof. Preferably, said inorganic salts are selected from the group

consisting of : $\text{Al}_2(\text{SO}_4)_3$; CaO ; CaCl_2 ; AlCl_3 ; MgSO_4 ; Silica; $\text{KAl}(\text{SO}_4)_2$; and MgCl_2 ; and mixtures thereof.

5 The second compound(s) in this binary heat generation system may be selected from the group consisting of : water; and polar solvents (like ethanol, methanol, acetone, etc.); and mixtures thereof.

10 Heat generation by a oxidations or reductions may be achieved by combining a oxidising agent with a reducing agent.

15 The first compound(s) in this binary heat generation system may be selected from the group consisting of an oxidizing agent and a mixture thereof. Preferably, said oxidizing agent is selected from the group consisting of : peroxygen-based oxidizing agents; and hypohalite-based oxidizing agents; and mixtures thereof. More preferably, said oxidizing agent is selected from the group consisting of : hydrogen peroxide; hypochlorous acid; hypochlorites; hypiodites; hypobromites; persulphates such as monopersulfate; percarbonates; perborates, persilicates; organic or inorganic peracids; hydroperoxides; and diacyl peroxides; and mixtures thereof. Even preferably, said oxidizing agent is selected from the group
20 consisting of : hydrogen peroxide; hypochlorous acid; hypochlorites; hypiodites; hypobromites; potassium monopersulfate; and sodium percarbonate; and mixtures thereof.

25 The second compound(s) in this binary heat generation system may be selected from the group consisting of a reducing agent and a mixture thereof. Preferably, said reducing agents are selected from the group consisting of : sulfides; sulfites; oxazolidines; ascorbic acid and salts thereof; and oxalic acid and salts thereof; and mixtures thereof. More preferably, said reducing agents are selected from the group consisting of : sodium sulfide; sodium sulfite; oxazolidine; ascorbic
30 acid; and oxalic acid; and mixtures thereof.

35 In a preferred embodiment wherein one of the two compositions herein is solid, said oxidising agent and said reducing agent may be included together in said the solid composition herein. In this case both the oxidising agent and the reducing agent are in their solid state and can thus not react with each other. The heat generating reaction has to be activated by an activator compound, for

example water. In this preferred embodiment wherein active ingredients are included in their solid state in a composition, the other of said two compositions herein comprises a suitable solvent for said first composition, preferably water.

- 5 Heat generation by hydration of substantially anhydrous compounds may be achieved by combining a substantially anhydrous compound with a suitable hydrant.

10 A suitable substantially anhydrous compound (first compound(s) in this binary heat generation system) is selected from the group consisting of : anhydrous zeolites; anhydrous alumino silicates; and mixtures thereof.

15 Suitable anhydrous zeolite can be produced by dehydration and/or calcination. Furthermore, suitable anhydrous zeolites are commercially available from UOP under the tradename Molecular Sieve UOP®.

20 A suitable hydrant (second compound(s) in this binary heat generation system) is selected from the group consisting of : water; and polar solvents (like ethanol, methanol, acetone, etc.); and mixtures thereof.

Heat generation by acid/base reactions may be achieved by combining an acid with a base.

25 The first compound(s) in this binary heat generation system may be selected from the group consisting of : organic and inorganic acids and mixtures thereof. Preferably, said organic acid is selected from the group consisting of strong organic acids having a pK_a of below 4, more preferably below 2, and mixtures thereof. More preferably, said organic acid is selected from the group consisting of : chloro acetic acid; dichloroacetic acid; trichloroacetic acid; formic acid; oxalic acid; acetic acid; acrylic acid; aliphatic acids; and lactic acid; and mixtures thereof. Preferably, said inorganic is selected from the group consisting of strong acids having a pK_a of below 4, more preferably below 2, and mixtures thereof. More preferably, said inorganic is selected from the group consisting of : HCl; H_2SO_4 ; HNO_3 ; H_4SiO_4 ; H_3PO_4 ; KH_2PO_4 ; and $H_4P_2O_7$; and mixtures thereof.

The second compound(s) in this binary heat generation system may be selected from the group consisting of : organic and inorganic bases and mixtures thereof. Preferably, said organic base is selected from the group consisting of : alkylamines; pyridines; and amides; and mixtures thereof. Preferably, said inorganic base is selected from the group consisting of : alkali and alkaline earth metal hydroxides; ammonia; and ammonium carbonate; and mixtures thereof. More preferably, said inorganic base is selected from the group consisting of : NaOH; KOH; $Al(OH)_3$; and mixtures thereof.

In a preferred embodiment wherein one of the two compositions herein is solid, said acid and said base may be included in the solid composition herein. In this case both the acid and base are in their solid state and can thus not react with each other. The heat generating reaction has to be activated by an activator compound, for example water. In this preferred embodiment wherein an acid and a base are included in their solid state in the solid composition, the other of said two compositions herein comprises a suitable solvent for said first composition, preferably water.

The cleaning performance of a given set of first and second compositions on a soiled carpet may be evaluated by the following test method : The two compositions according to the present invention are applied onto the stained portion of a carpet, left to act thereon from 1 to 60 minutes, preferably 20 minutes, after which the carpet is vacuum cleaned using any commercially available vacuum cleaners like for instance a standard Hoover® 1300W vacuuming machine. The soils used in this test may be particulate stains, greasy/oily stains or enzymatic stain as described herein. The cleaning performance may be evaluated by visual using panel score units to rate the cleaning performance. The visual grading may be performed by a group of expert panelists using panel score units (PSU). To assess the carpet cleaning benefits of a given set of first and second compositions a PSU-scale ranging from 0, meaning no noticeable difference in cleanliness of a treated, initially soiled, carpet versus an untreated, similarly soiled, carpet, to 4, meaning a clearly noticeable difference in cleanliness of a treated, initially soiled, carpet versus an untreated, similarly soiled, carpet, can be applied.

Alternatively, the cleaning performance of a given set of first and second compositions on a soiled carpet may be evaluated by the measurement of the delta L with a miniscan, for example a colorimeter CR310® commercially available from Minolta. Delta L represents the difference of gray intensity between a reference (soiled carpet tile) and a carpet tile treated with the compositions to be assessed, this means with the compositions as described herein. The difference in cleaning performance between different sets of compositions may be assessed by comparing the delta Ls that have been measured for said sets of compositions. In practice, the miniscan takes a photo of the carpet tile and quantitatively analysis its gray intensity (L is the quantitative value, ranging from 100% for a pure white to 0% for a pure black). The higher the delta L, wherein $\Delta L = L(\text{sample}) - L(\text{reference})$, the better is the cleaning performance of a sample (set of compositions).

15 Optional ingredients

The first and/or second compositions herein may comprise optional ingredients in addition to the compounds of the binary heat generating system. When including optional ingredients in said composition the compatibility of said optional ingredients with the compounds of the binary heat generating system has to be taken into account. Indeed, optional ingredients, that alter, preferably reduce or even prohibit, the compositions ability to create heat with another composition are not suitable to be included in said composition. This is strongly dependent on the chosen binary heat generating system as described above and has to be assessed by the person skilled in the art for each heat generating system as described above separately.

Peroxygen bleach

As an optional but highly preferred ingredient the compositions according to the present invention may comprise a peroxygen bleach, in addition to the peroxygen bleach oxidising agent when present herein.

Suitable peroxygen bleaches to be used herein are selected from the group consisting of : hydrogen peroxide; water soluble sources of hydrogen peroxide; organic or inorganic peracids; hydroperoxides; diacyl peroxides; and mixtures thereof.

As used herein a hydrogen peroxide source refers to any compound that produces perhydroxyl ions when said compound is in contact with water. Suitable water-soluble sources of hydrogen peroxide for use herein are selected from the group consisting of percarbonates, perborates and persilicates and mixtures thereof.

Suitable diacyl peroxides for use herein are selected from the group consisting of aliphatic, aromatic and aliphatic-aromatic diacyl peroxides, and mixtures thereof.

Suitable aliphatic diacyl peroxides for use herein are dilauroyl peroxide, didecanoyl peroxide, dimyristoyl peroxide, or mixtures thereof. A suitable aromatic diacyl peroxide for use herein is for example benzoyl peroxide. A suitable aliphatic-aromatic diacyl peroxide for use herein is for example lauroyl benzoyl peroxide. Such diacyl peroxides have the advantage to be particularly safe to carpets and carpet dyes while delivering excellent bleaching performance.

Suitable organic or inorganic peracids for use herein are selected from the group consisting of : persulphates such as monopersulfate; peroxyacids such as diperoxydodecandioic acid (DPDA) and phthaloyl amino peroxycaproic acid (PAP); magnesium perphthalic acid; perlauric acid; perbenzoic and alkylperbenzoic acids; and mixtures thereof.

Suitable hydroperoxides for use herein are selected from the group consisting of tert-butyl hydroperoxide, cumyl hydroperoxide, 2,4,4-trimethylpentyl-2-hydroperoxide, di-isopropylbenzene-monohydroperoxide, tert-amyl hydroperoxide and 2,5-dimethyl-hexane-2,5-dihydroperoxide and mixtures thereof. Such hydroperoxides have the advantage to be particularly safe to carpets and carpet dyes while delivering excellent bleaching performance.

Preferred peroxygen bleaches herein are selected from the group consisting of : hydrogen peroxide; water soluble sources of hydrogen peroxide; organic or inorganic peracids; hydroperoxides; and diacyl peroxides; and mixtures thereof. More preferred peroxygen bleaches herein are selected from the group consisting of hydrogen peroxide, water soluble sources of hydrogen peroxide

and diacyl peroxides and mixtures thereof. Even more preferred peroxygen bleaches herein are selected from the group consisting of hydrogen peroxide, water soluble sources of hydrogen peroxide, aliphatic diacyl peroxides, aromatic diacyl peroxides and aliphatic-aromatic diacyl peroxides and mixtures thereof.

- 5 Most preferred peroxygen bleaches herein are hydrogen peroxide, water soluble sources of hydrogen peroxide or mixtures thereof.

Typically, the liquid compositions herein comprise from 0.01% to 20%, preferably from 0.5 % to 10%, and more preferably from 1% to 7% by weight of the total composition of a peroxygen bleach, or mixtures thereof.

The presence of a peroxygen bleach in preferred compositions employed in the process of treating a fabric according to the present invention contributes to the excellent cleaning and sanitizing performance on various types of soils including on spot stains like bleachable stains (e.g., coffee, beverage, food) of the compositions of the present invention.

By "bleachable stains" it is meant herein any soils or stains containing ingredients sensitive to bleach that can be found on any carpet, e.g., coffee or tea.

Surfactants

As an optional but highly preferred ingredient the compositions according to the present invention may comprise a surfactant or a mixture thereof.

Typically, the compositions herein may comprise up to 50%, preferably from 0.1% to 20%, more preferably from 0.5% to 10% and most preferably from 1% to 5% by weight of the total composition of a surfactant.

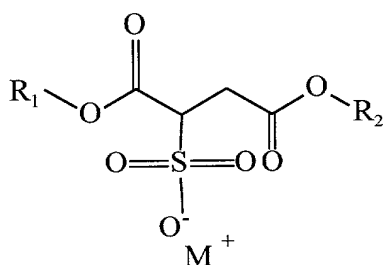
Such surfactants may be selected from those well known in the art including anionic, nonionic, zwitterionic, amphoteric and cationic surfactants and mixtures thereof.

Particularly suitable surfactants to be used herein are anionic surfactants. Said anionic surfactants are preferred herein as they further contribute to the outstanding stain removal performance of the compositions of the present

invention on various types of stains. Moreover they do not stick on carpet, thereby reducing resoiling.

Suitable anionic surfactants include sulfosuccinate surfactants, sulfosuccinamate surfactants, sulfosuccinamide surfactants, alkyl carboxylate surfactants, sarcosinate surfactants, alkyl sulfate surfactants, alkyl sulphonate surfactants, alkyl glycerol sulfate surfactants, alkyl glycerol sulphonate surfactants and mixtures thereof.

Suitable sulfosuccinate surfactants are according to the formula



wherein : R₁ is hydrogen or a hydrocarbon group selected from the group consisting of straight or branched alkyl radicals containing from 6 to 20 carbon atoms, preferably 8 to 18 carbon atoms, more preferably 10 to 16 carbon atoms, and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group; R₂ is a hydrocarbon group selected from the group consisting of straight or branched alkyl radicals containing from 6 to 20 carbon atoms, preferably 8 to 18 carbon atoms, more preferably 10 to 16 carbon atoms, and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group; and M is hydrogen or a cationic moiety, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

Such sulfosuccinate surfactants are commercially available under the tradenames Aerosol® from Cytec, Anionyx® from Stepan, Arylene® from Hart,

Setacin® from Zschimmer & Schwarz, Mackanate® from McIntyre and Monawet® from Mona Industries.

Suitable alkyl sulphonate surfactants for use herein include water-soluble salts or acids of the formula RSO_3M wherein R is a C_6 - C_{20} linear or branched, saturated or unsaturated alkyl group, preferably a C_8 - C_{18} alkyl group and more preferably a C_{10} - C_{16} alkyl group, and M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium), or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

An example of a C_{14} - C_{16} alkyl sulphonate is Hostapur® SAS available from Hoechst.

Suitable alkyl sulphate surfactants for use herein are according to the formula $\text{R}_1\text{SO}_4\text{M}$ wherein R_1 represents a hydrocarbon group selected from the group consisting of straight or branched alkyl radicals containing from 6 to 20, preferably 8 to 18, more preferably 10 to 16, carbon atoms and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group. M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

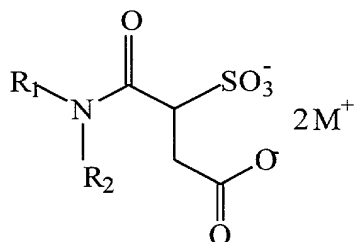
By "linear alkyl sulphate or sulphonate" it is meant herein a non-substituted alkyl sulphate or sulphonate wherein the alkyl chain comprises from 6 to 20 carbon atoms, preferably from 8 to 18 carbon atoms, and more preferably from 10 to 16 carbon atoms, and wherein this alkyl chain is sulphated or sulphonated at one terminus.

By "branched sulphonate or sulphate", it is meant herein an alkyl chain having from 6 to 20 total carbon atoms, preferably from 8 to 18 total carbon atoms, and

more preferably from 10 to 16 total carbon atoms, wherein the main alkyl chain is substituted by at least another alkyl chain, and wherein the alkyl chain is sulphated or sulphonated at one terminus.

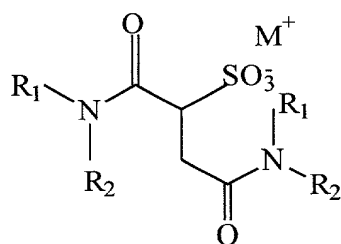
- 5 Particularly preferred branched alkyl sulphates to be used herein are those containing from 10 to 14 total carbon atoms like Isalchem 123 AS®. Isalchem 123 AS® commercially available from Enichem is a C₁₂₋₁₃ surfactant which is 94% branched. This material can be described as CH₃-(CH₂)_m-CH(CH₂OSO₃Na)-(CH₂)_n-CH₃ where n+m = 8-9. Also preferred alkyl sulphates
 10 are the alkyl sulphates where the alkyl chain comprises a total of 12 carbon atoms, i.e., sodium 2-butyl octyl sulphate. Such alkyl sulphate is commercially available from Condea under the trade name Isofol® 12S. Particularly suitable liner alkyl sulphonates include C₁₂-C₁₆ paraffin sulphonate like Hostapur® SAS commercially available from Hoechst.

- 15 Suitable sulfosuccinamate surfactants for use herein are according to the formula



- 20 wherein R₁ and R₂ each independently represent a hydrocarbon group selected from the group consisting of straight or branched alkyl radicals containing from 6 to 20, preferably 8 to 18, more preferably 10 to 16, carbon atoms and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group. M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium,
 25 magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

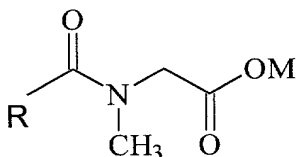
- 30 Suitable sulfosuccinamide surfactants for use herein are according to the formula



wherein R₁ and R₂ each independently represent a hydrocarbon group selected from the group consisting of straight or branched alkyl radicals containing from 6 to 20, preferably 8 to 18, more preferably 10 to 16, carbon atoms and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group. M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

Suitable alkyl carboxylate surfactants for use herein are according to the formula RCO₂M wherein : R represents a hydrocarbon group selected from the group consisting of straight or branched alkyl radicals containing from 6 to 20, preferably 8 to 18, more preferably 10 to 16, carbon atoms and alkyl phenyl radicals containing from 6 to 18 carbon atoms in the alkyl group. M is H or a cation, e.g., an alkali metal cation (e.g., sodium, potassium, lithium, calcium, magnesium and the like) or ammonium or substituted ammonium (e.g., methyl-, dimethyl-, and trimethyl ammonium cations and quaternary ammonium cations, such as tetramethyl-ammonium and dimethyl piperdinium cations and quaternary ammonium cations derived from alkylamines such as ethylamine, diethylamine, triethylamine, and mixtures thereof, and the like).

Suitable sarcosinate surfactants to be used herein include acyl sarcosinate or mixtures thereof, in its acid and/or salt form, preferably long chain acyl sarcosinates having the following formula:



wherein M is hydrogen or a cationic moiety and wherein R is an alkyl group of from 11 to 15 carbon atoms, preferably of from 11 to 13 carbon atoms. Preferred M are hydrogen and alkali metal salts, especially sodium and potassium. Said acyl sarcosinate surfactants are derived from natural fatty acids and the amino-acid sarcosine (N-methyl glycine). They are suitable to be used as aqueous solution of their salt or in their acidic form as powder. Being derivatives of natural fatty acids, said acyl sarcosinates are rapidly and completely biodegradable and have good skin compatibility.

Accordingly, particularly preferred long chain acyl sarcosinates to be used herein include C₁₂ acyl sarcosinate, i.e., an acyl sarcosinate according to the above formula wherein M is hydrogen and R is an alkyl group of 11 carbon atom, sodium N-lauroyl sarcosinate, i.e., an acyl sarcosinate according to the above formula wherein M is sodium and R is an alkyl group of 11 carbon atom, and C₁₄ acyl sarcosinate (i.e., an acyl sarcosinate according to the above formula wherein M is hydrogen and R is an alkyl group of 13 carbon atoms). Sodium N-lauroyl sarcosinate is commercially available, for example, as Hamposyl L-30® supplied by Hampshire or Crodasinc LS30® supplied by Croda. C₁₄ acyl sarcosinate is commercially available, for example, as Hamposyl M-30® supplied by Hampshire or Crodasinc MS30® supplied by Croda.

Suitable nonionic surfactants include amine oxide surfactants. Suitable amine oxide surfactants are according to the formula R₁R₂R₃NO, wherein each of R₁, R₂ and R₃ is independently a saturated substituted or unsubstituted, linear or branched alkyl groups of from 1 to 30 carbon atoms, preferably of from 1 to 20 carbon atoms, and mixtures thereof.

Particularly preferred amine oxide surfactants to be used according to the present invention are amine oxide surfactants having the following formula R₁R₂R₃NO wherein R₁ is a saturated linear or branched alkyl group of from 1 to 30 carbon atoms, preferably of from 6 to 20 carbon atoms, more preferably of from 6 to 16 carbon atoms, and wherein R₂ and R₃ are independently

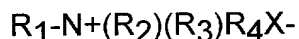
substituted or unsubstituted, linear or branched alkyl groups of from 1 to 4 carbon atoms, preferably of from 1 to 3 carbon atoms, and more preferably are methyl groups. Preferred amine oxide surfactants used herein are pure-cut amine oxide surfactants, i.e., a pure single amine oxide surfactant, e.g. C₈ N,N-dimethyl amine oxide, as opposed to mixtures of amine oxide surfactants of different chain lengths

Suitable amine oxide surfactants for use herein are for instance pure cut C₈ amine oxide, pure cut C₁₀ amine oxide, pure cut C₁₄ amine oxide, natural blend C₈-C₁₀ amine oxides as well as natural blend C₁₂-C₁₆ amine oxides. Such amine oxide surfactants may be commercially available from Hoechst or Stephan.

Suitable nonionic surfactants for use herein also include any ethoxylated C₆-C₂₄ fatty alcohol nonionic surfactant, alkyl propoxylates and mixtures thereof, fatty acid C₆-C₂₄ alkanolamides, C₆-C₂₀ polyethylglycol ethers, polyethylene glycol with molecular weight 1000 to 80000 and glucose amides, alkyl pyrrolidones.

Suitable cationic surfactants for use herein include quaternary ammonium compounds of the formula R₁R₂R₃R₄N⁺ where R₁, R₂ and R₃ are methyl groups, and R₄ is a C₁₂-15 alkyl group, or where R₁ is an ethyl or hydroxy ethyl group, R₂ and R₃ are methyl groups and R₄ is a C₁₂-15 alkyl group.

Suitable zwitterionic surfactants are zwitterionic betaine surfactants. Suitable zwitterionic betaine surfactants for use herein contain both a cationic hydrophilic group, i.e., a quaternary ammonium group, and anionic hydrophilic group on the same molecule at a relatively wide range of pH's. The typical anionic hydrophilic groups are carboxylates and sulphonates, although other groups like sulfates, phosphonates, and the like can be used. A generic formula for the zwitterionic betaine surfactant to be used herein is :



wherein R₁ is a hydrophobic group; R₂ is hydrogen, C₁-C₆ alkyl, hydroxy alkyl or other substituted C₁-C₆ alkyl group; R₃ is C₁-C₆ alkyl, hydroxy alkyl or other substituted C₁-C₆ alkyl group which can also be joined to R₂ to form ring

structures with the N, or a C₁-C₆ sulphonate group; R₄ is a moiety joining the cationic nitrogen atom to the hydrophilic group and is typically an alkylene, hydroxy alkylene, or polyalkoxy group containing from 1 to 10 carbon atoms; and X is the hydrophilic group, which is a carboxylate or sulphonate group.

5

Preferred hydrophobic groups R₁ are aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chains that can contain linking groups such as amido groups, ester groups. More preferred R₁ is an alkyl group containing from 1 to 24, preferably from 8 to 18, and more preferably from 10 to 16 carbon atoms. These simple alkyl groups are preferred for cost and stability reasons. However, the hydrophobic group R₁ can also be an amido radical of the formula R_a-C(O)-NH-(C(R_b)₂)_m, wherein R_a is an aliphatic or aromatic, saturated or unsaturated, substituted or unsubstituted hydrocarbon chain, preferably an alkyl group containing from 8 up to 20, preferably up to 18, more preferably up to 16 carbon atoms, R_b is selected from the group consisting of hydrogen and hydroxy groups, and m is from 1 to 4, preferably from 2 to 3, more preferably 3, with no more than one hydroxy group in any (C(R_b)₂) moiety.

Preferred R₂ is hydrogen, or a C₁-C₃ alkyl and more preferably methyl. Preferred R₃ is C₁-C₄ sulphonate group, or a C₁-C₃ alkyl and more preferably methyl. Preferred R₄ is (CH₂)_n wherein n is an integer from 1 to 10, preferably from 1 to 6, more preferably is from 1 to 3.

Some common examples of betaine/sulphobetaine are described in U.S. Pat. Nos. 2,082,275, 2,702,279 and 2,255,082, incorporated herein by reference.

Examples of particularly suitable alkyldimethyl betaines include coconut-dimethyl betaine, lauryl dimethyl betaine, decyl dimethyl betaine, 2-(N-decyl-N, N-dimethyl-ammonia)acetate, 2-(N-coco N, N-dimethylammonio) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, cetyl dimethyl betaine, stearyl dimethyl betaine. For example Coconut dimethyl betaine is commercially available from Seppic under the trade name of Amonyl 265®. Lauryl betaine is commercially available from Albright & Wilson under the trade name Empigen BB/L®.

35

Examples of amidobetaines include cocoamidoethylbetaine, cocoamidopropyl betaine or C₁₀-C₁₄ fatty acylamidopropylene(hydropropylene)sulfobetaine. For example C₁₀-C₁₄ fatty acylamidopropylene(hydropropylene)sulfobetaine is commercially available from Sherex Company under the trade name "Varion CAS® sulfobetaine".

A further example of betaine is Lauryl-immino-dipropionate commercially available from Rhone-Poulenc under the trade name Mirataine H2C-HA®.

A preferred surfactant for use herein is an anionic surfactant or a zwitterionic surfactant or a mixture thereof, a more preferred surfactant is a sulfosuccinate surfactant, sulfosuccinamate surfactant, sulfosuccinamide surfactant, carboxylate surfactant, sarcosinate surfactant, alkyl sulfate surfactant, alkyl sulphonate surfactant, alkyl glycerol sulfate surfactant, alkyl glycerol sulphonate surfactant or a zwitterionic betaine surfactant and mixtures thereof.

In a preferred embodiment a preferred surfactant for use herein is a sarcosinate surfactant, an alkyl sulphonate surfactant, an alkyl sulphate surfactant, or a zwitterionic betaine surfactant and mixtures thereof, and the most preferred surfactant herein is an alkyl sarcosinate surfactant.

In another preferred a preferred surfactant for use herein is a mixture of a sulfosuccinate surfactant and a second anionic surfactant. More preferably, said surfactant is a mixture of a sulfosuccinate surfactant and a sulphate surfactant. Most preferably, said surfactant is a sulfosuccinate surfactant.

The presence of a surfactant in preferred compositions when employed in the process of treating a fabric according to the present invention contributes to the excellent cleaning performance on various types of soils including diffuse soils (e.g., particulate and/or greasy soils) that tend to accumulate in the so called "high traffic areas" but also in delivering good cleaning performance on other types of stains or soils, i.e., proteinic stains like blood.

Solvents

As an optional but highly preferred ingredient the compositions according to the present invention may comprise a solvent or a mixture thereof.

Typically, the compositions herein may comprise up to 90%, preferably from 0.1% to 20%, more preferably from 0.5% to 10% and most preferably from 1% to 5% by weight of the total composition of a solvent or a mixture thereof.

5

Suitable solvents for use herein include aliphatic and/or aromatic alcohol, glycol ethers and/or derivatives thereof, polyol and mixtures thereof.

10

Suitable aromatic alcohols to be used herein are according to the formula R_1-OH wherein R_1 is an alkyl substituted or non-alkyl substituted aryl group of from 1 to 20 carbon atoms, preferably from 2 to 15 and more preferably from 2 to 10. A suitable aromatic alcohol to be used herein is benzyl alcohol.

15

Suitable aliphatic alcohols to be used herein are according to the formula R_2-OH wherein R_2 is a linear or branched saturated or unsaturated hydrocarbon chain of from 1 to 20 carbon atoms, preferably from 1 to 10 and more preferably from 2 to 6. Highly preferred herein are aliphatic alcohols with 2 to 4 carbon atoms and most preferably 4 carbon atoms, or mixtures thereof. Suitable aliphatic alcohols to be used herein include linear alcohol like 2-octanol, decanol, isopropyl alcohol, propyl alcohol, ethanol and/or methanol. Highly preferred herein are ethanol, isopropyl alcohol or a mixture thereof.

20

Ethanol may be commercially available from Eridania Italia under its chemical name.

25

Isopropanol may be commercially available from Merck/BDH Italia under its chemical name.

30

Suitable glycol ethers and/or derivatives thereof to be used herein include monoglycol ethers and/or derivatives thereof, polyglycol ethers and/or derivatives thereof and mixtures thereof.

35

Suitable monoglycol ethers and derivatives thereof to be used herein include n-butoxypropanol (n-BP), CELLOSOLVE® solvents or mixtures thereof. Preferred Cellosolve® solvents include propoxy ethyl acetate salt (i.e., Propyl Cellosolve acetate salt®), ethanol-2-butoxy phosphate salt (i.e., Butyl Cellosolve phosphate

salt®), 2-(Hexyloxy)ethanol (i.e., 2-hexyl Cellosolve®), 2-ethoxy ethanol (i.e., 2-ethyl Cellosolve®), 2-butoxyethanol (i.e., 2-buthyl Cellosolve®) or mixtures thereof.

- 5 Suitable polyglycol ethers and derivatives thereof to be used herein include n-butoxypropoxypropanol (n-BPP), butyl triglycol ether (BTGE), butyl diglycol ether (BDGE), CARBITOL® solvents or mixtures thereof.

10 Preferred CARBITOL® solvents are compounds of the 2-(2-alkoxyethoxy)ethanol class, 2-(2-alkoxyethoxy)propanol class and/or 2-(2-alkoxyethoxy)butanol class wherein the alkoxy group is derived from ethyl, propyl or butyl. A preferred carbitol is 2-(2-butoxyethoxy)ethanol also known as butyl carbitol®.

15 Preferred glycol ethers and/or derivatives thereof are 2-ethoxyethanol, 2-butoxyethanol, n-butoxypropoxypropanol, butyl carbitol® or mixtures thereof.

20 Suitable polyol solvents to be used herein are the polyols having at least 2 hydroxyl groups (-OH) like diols. Suitable diols to be used herein include 2-ethyl-1,3-hexanediol, 2,2,4-trimethyl-1,3-pentanediol, methyl-2,4 pentanediol or mixture thereof.

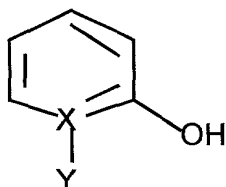
25 Other suitable solvent may be selected from the group consisting of : terpenes such as pinene, limonene and geraniol; ketones such as dipropyl ketone, butyrolactone and acetophenone; aromatic solvents such as toluene and xylene; and halogenated solvents such as bromopropane and chlorobenzene; and mixtures thereof.

30 The solvents, when present, further contribute to the excellent overall cleaning performance of the present invention. Additionally, their addition in the compositions herein also enhances the sanitising properties of the compositions.

Stabilizing agents

35 The compositions of the present invention may further comprise a stabilizing agent selected from the group consisting of hydroxy pyridine N-oxides or derivatives thereof and mixtures thereof.

Suitable hydroxy pyridine N-oxides or derivatives thereof are according to the following formula:



5

wherein X is nitrogen, Y is one of the following groups oxygen, -CHO, -OH, -
(CH₂)_n-COOH, wherein n is an integer of from 0 to 20, preferably of from 0 to 10
and more preferably is 0, and wherein Y is preferably oxygen. Accordingly
particularly preferred hydroxy pyridine N-oxides or derivatives thereof to be used
herein is 2-hydroxy pyridine N-oxide.

10

Hydroxy pyridine N-oxides or derivatives thereof may be commercially available
from Sigma.

15

Typically, the compositions herein may comprise up to 2%, preferably from
0.001% to 1% and more preferably from 0.001% to 0.5% by weight of the total
composition of a hydroxy pyridine N-oxide or derivatives thereof or mixtures
thereof.

20

Chelating agents

The compositions of the present invention may further comprise a chelating
agent.

25

Suitable chelating agents are those known to those skilled in the art. Particularly
suitable chelating agents include for examples phosphonate chelating agents,
polyfunctionally-substituted aromatic chelating agents, amino carboxylate
chelating agents, other chelating agents like ethylene diamine N,N'- disuccinic
acid and mixtures thereof.

30

Typically, the compositions herein may comprise up to 4%, preferably from
0.001% to 1%, and more preferably from 0.001% to 0.5% by weight of the total
composition of a chelating agent.

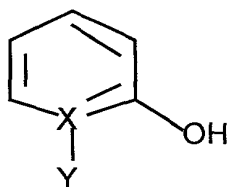
Suitable phosphonate chelating agents to be used herein may include ethydrionic acid, alkali metal ethane 1-hydroxy diphosphonates as well as amino phosphonate compounds, including amino alkylene poly (alkylene phosphonate), alkali metal ethane 1-hydroxy diphosphonates, nitrilo trimethylene phosphonates, ethylene diamine tetra methylene phosphonates, and diethylene triamine penta methylene phosphonates. The phosphonate compounds may be present either in their acid form or as salts of different cations on some or all of their acid functionalities. Preferred phosphonate chelating agents to be used herein are diethylene triamine penta methylene phosphonates (DETPMP). Such phosphonate chelating agents are commercially available from Monsanto under the trade name DEQUEST®.

Polyfunctionally-substituted aromatic chelating agents may also be useful in the compositions herein. See U.S. patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy -3,5-disulfobenzene.

A preferred biodegradable chelating agent for use herein is ethylene diamine N,N'- disuccinic acid, or alkali metal, or alkaline earth, ammonium or substitutes ammonium salts thereof or mixtures thereof. Ethylenediamine N,N'- disuccinic acids, especially the (S,S) isomer, have been extensively described in US patent 4, 704, 233, November 3, 1987. to Hartman and Perkins. Ethylenediamine N,N'- disuccinic acid is, for instance, commercially available under the tradename ssEDDS® from Palmer Research Laboratories.

Suitable amino carboxylate chelating agents to be used herein include ethylene diamine tetra acetates, diethylene triamine pentaacetates, diethylene triamine pentaacetate (DTPA), N-hydroxyethylethylenediamine triacetates, nitrilotriacetates, ethylenediamine tetrapropionates, triethylenetetraaminehexa-acetates, ethanoldiglycines, propylene diamine tetracetic acid (PDTA) and methyl glycine di-acetic acid (MGDA), both in their acid form, or in their alkali metal, ammonium, and substituted ammonium salt forms. A particularly suitable amino carboxylate to be used herein is diethylene triamine penta acetic acid (DTPA).

Other suitable chelating agents to be used herein include salicylic acid or derivatives thereof, or mixtures thereof according to the following formula:



wherein X is carbon, Y is one of the following groups -CHO, -OH, -(CH₂)_n-COOH, and preferably is -(CH₂)_n-COOH, and wherein n is an integer of from 0 to 20, preferably of from 0 to 10 and more preferably is 0. Salicylic acid and derivatives thereof may be used herein either in their acid form or in their salts form as for example sodium salts.

Salicylic acid is particularly preferred herein and may be commercially available from Rhone Poulenc.

Radical scavengers:

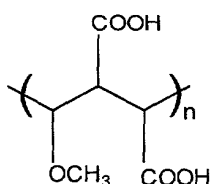
The compositions herein may comprise a radical scavenger as another optional ingredient. Suitable radical scavengers for use herein include the well-known substituted mono and di hydroxy benzenes and derivatives thereof, alkyl- and aryl carboxylates and mixtures thereof. Preferred radical scavengers for use herein include trimethoxy benzoic acid (TMBA), di-tert-butyl hydroxy toluene (BHT), p-hydroxy-toluene, hydroquinone (HQ), di-tert-butyl hydroquinone (DTBHQ), mono-tert-butyl hydroquinone (MTBHQ), tert-butyl-hydroxy anysole (BHA), p-hydroxy-anysol, benzoic acid, 2,5-dihydroxy benzoic acid, 2,5-dihydroxyterephthalic acid, toluic acid, catechol, t-butyl catechol, 4-allyl-catechol, 4-acetyl catechol, 2-methoxy-phenol, 2-ethoxy-phenol, 2-methoxy-4-(2-propenyl)phenol, 3,4-dihydroxy benzaldehyde, 2,3-dihydroxy benzaldehyde, benzylamine, 1,1,3-tris(2-methyl-4-hydroxy-5-t-butylphenyl) butane, tert-butyl-hydroxy-anyline, p-hydroxy anyline as well as n-propyl-gallate. Highly preferred for use herein is di-tert-butyl hydroxy toluene, which is for example commercially available from SHELL under the trade name IONOL CP® and/or tert-butyl-hydroxy anysole and/or propyl gallate. These radical scavengers further contribute to the stability of the compositions herein.

Typically, the compositions according to the present invention may comprise up to 5%, preferably from 0.002% to 1.5% by weight and more preferably from 0.002% to 0.5% by weight of the total composition of a radical scavenger.

The compositions as disclosed herein may comprise as a preferred optional ingredient an anti-resoiling agent.

Suitable anti-resoiling agents include anti-resoiling polymers.

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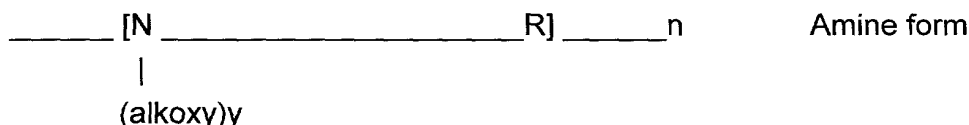
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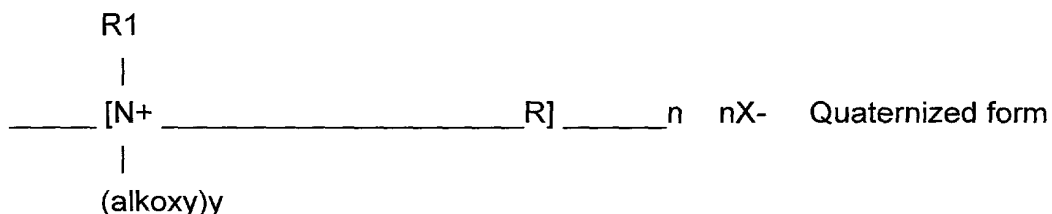
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Suitable anti-resoiling polymers include soil suspending polyamine polymers. Any soil suspending polyamine polymer known to those skilled in the art may also be used herein. Particularly suitable polyamine polymers for use herein are alkoxyated polyamines. Such materials can conveniently be represented as molecules of the empirical structures with repeating units :

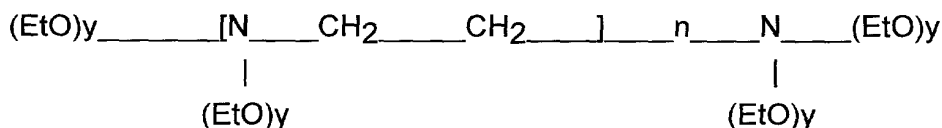


and



wherein R is a hydrocarbyl group, usually of 2-6 carbon atoms; R₁ may be a C₁-C₂₀ hydrocarbon; the alkoxy groups are ethoxy, propoxy, and the like, and y is from 2 to 30, most preferably from 7 to 20; n is an integer of at least 2, preferably from 2 to 40, most preferably from 2 to 5; and X⁻ is an anion such as halide or methylsulfate, resulting from the quaternization reaction.

The most highly preferred polyamines for use herein are the so-called ethoxylated polyethylene amines, i.e., the polymerized reaction product of ethylene oxide with ethyleneimine, having the general formula :



wherein y is from 2 to 50, preferably from 5 to 30, and n is from 1 to 40, preferably from 2 to 40. Particularly preferred for use herein is an ethoxylated polyethylene amine, in particular an ethoxylated polyethylene amine wherein n=2 and y=20, and an ethoxylated polyethylene amine wherein n=40 and y=7.

Suitable ethoxylated polyethylene amines are commercially available from Nippon Shokubai CO., LTD under the product names ESP-0620A® (ethoxylated polyethylene amine wherein $n=2$ and $y=20$) or from BASF under the product names ES-8165 and from BASF under the product name LUTENSIT K - 187/50® (ethoxylated polyethylene amine wherein $n=40$ and $y=7$).

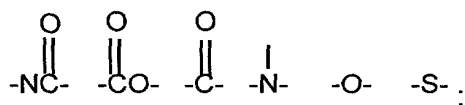
Suitable anti-resoiling polymers also include polyamine N-oxide polymers.

10 Suitable polyamine N-oxide polymers for use herein are according to the following formula : $R-A_x-P$; containing at least one N-oxide group (N-O group);

wherein : P is a polymerizable unit to which an N-O group can be attached and/or the N-O group can form part of the polymerizable unit;

15

A is one of the following structures:

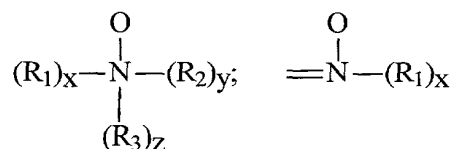


20 x is 0 or 1;

and R is an aliphatic, ethoxylated aliphatic, aromatic, heterocyclic or alicyclic group or any combination thereof to which the N-O group can be attached to R or the nitrogen of the N-O group is part of R.

25

By "N-O group" it is meant one of the following general structures:



30 wherein R_1 , R_2 , R_3 are aliphatic, aromatic, heterocyclic or alicyclic groups or combinations thereof; x, y and z are 0 or 1; and the nitrogen of the N-O group can be attached or form part of any of the aforementioned groups.

Any polymerizable unit P can be used as long as the amine oxide polymer formed is water-soluble and provides the carpet treatment composition with carpet cleaning and/or carpet anti-resoiling benefits. Preferred polymerizable unit P are vinyl, alkylenes, esters, ethers, amides, imides, acrylates and mixtures thereof. A more preferred polymerizable unit P is vinyl.

Preferred polyamine N-oxide polymers are those wherein R is a heterocyclic group such as pyridine, pyrrole, imidazole, or a derivative thereof, to which the nitrogen of the N-O group can be attached or the N-O group is part of these groups. Most preferred polyamine N-oxide polymers are those wherein R is a pyridine.

The polyamine N-oxide polymer can be obtained in almost any degree of polymerization. Typically, the average molecular weight is within the range of 1,000 to 100,000; more preferred 5,000 to 100,000; most preferred 5,000 to 25,000.

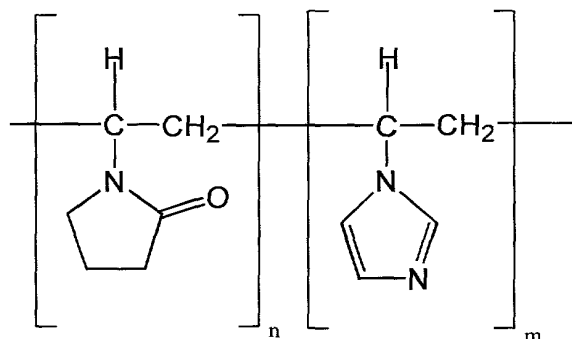
Suitable polyamine N-oxide polymer are polyvinyl pyridine-N-oxide polymers wherein : the polymerizable unit P is vinyl; $x=0$; and R is pyridine wherein the nitrogen of the N-O group is part of.

Suitable poly vinyl pyridine-N-oxide polymers are commercially available from Hoechst under the trade name of Hoe S 4268®, and from Reilly Industries Inc. under the trade name of PVNO.

Furthermore, suitable anti-resoiling polymers include N-vinyl polymer.

Suitable N-vinyl polymers include polyvinyl pyrrolidone polymers, co-polymers of N-vinylpyrrolidone and N-vinylimidazole, co-polymers of N-vinylpyrrolidone and acrylic acid, and mixtures thereof.

Suitable co-polymers of N-vinylpyrrolidone and N-vinylimidazole polymers (referred to as a class as "PVPVI") are according to the formula :



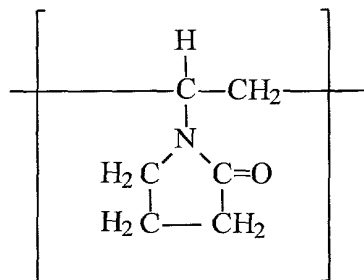
in which n is between 50 and 500 and preferably between 80 and 200 and m is
5 between 50 and 500 and preferably between 80 and 200.

Preferably the PVPVI has an average molecular weight range from 1,000 to
100,000, more preferably from 5,000 to 100,000, and most preferably from 5,000
10 to 20,000. (The average molecular weight range is determined by light scattering
as described in Barth, et al., Chemical Analysis, Vol 113. "Modern Methods of
Polymer Characterization", the disclosures of which are incorporated herein by
reference.)

The PVPVI co-polymers typically have a molar ratio of N-vinylimidazole to N-
15 vinylpyrrolidone from 1:1 to 0.2:1, more preferably from 0.8:1 to 0.3:1, most
preferably from 0.6:1 to 0.4:1. These co-polymers can be either linear or
branched.

Suitable co-polymers of N-vinylpyrrolidone and N-vinylimidazole are commercially
20 available from BASF, under the trade name of Sokalan® PG55.

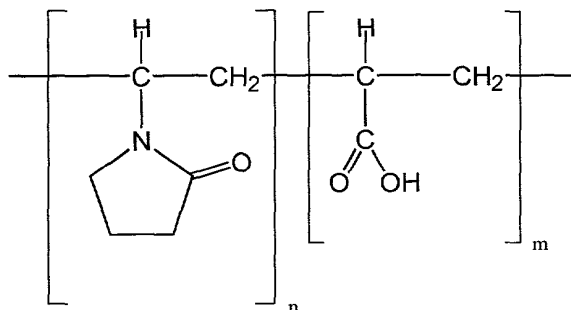
Suitable polyvinylpyrrolidone ("PVP") for use herein are homopolymers of N-
vinylpyrrolidone having the following repeating monomer:



Preferred vinylpyrrolidone homopolymers for use herein have an average molecular weight of from 1,000 to 100,000, preferably from 5,000 to 100,000, and more preferably from 5,000 to 20,000.

Suitable vinylpyrrolidone homopolymers are commercially available from BASF under the trade names Luviskol® K15 (viscosity molecular weight of 10,000), Luviskol® K25 (viscosity molecular weight of 24,000), Luviskol® K30 (viscosity molecular weight of 40,000), and other vinylpyrrolidone homopolymers known to persons skilled in the detergent field (see for example EP-A-262,897 and EP-A-256,696).

Suitable co-polymers of N-vinylpyrrolidone and acrylic acid (referred to as a class as "PV/AA") are according to the formula :



in which n is between 50 and 1000 and preferably between 100 and 200 and m is between 150 and 3000 and preferably between 300 and 600.

Preferably the PV/AA have an average molecular weight range from 1,000 to 100,000, more preferably from 5,000 to 100,000, and most preferably from 5,000 to 25,000.

Suitable co-polymers of N-vinylpyrrolidone and acrylic acid are commercially available from BASF under the trade name Sokalan® PG 310.

- 5 Preferred N-vinyl polymers are polyvinyl pyrrolidone polymers, co-polymers of N-vinylpyrrolidone and N-vinylimidazole, co-polymers of N-vinylpyrrolidone and acrylic acid, and mixtures thereof, even more preferred are polyvinyl pyrrolidone polymers.

- 10 Suitable anti-resoiling polymers also include soil suspending polycarboxylate polymers.

- Any soil suspending polycarboxylate polymer known to those skilled in the art can be used according to the present invention such as homo- or co-polymeric polycarboxylic acids or their salts including polyacrylates and copolymers of maleic anhydride or/and acrylic acid and the like. Indeed, such soil suspending polycarboxylate polymers can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalononic acid. The presence in the polymeric polycarboxylates herein of monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than 40% by weight.

- Particularly suitable polymeric polycarboxylates to be used herein can be derived from acrylic acid, including polyacrylic polymers and copolymers of acrylic acid. Most preferred anti-resoiling polymers are copolymer of acrylic acid and methacrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from 2,000 to 10,000, more preferably from 4,000 to 7,000 and most preferably from 4,000 to 5,000. Water-soluble salts of such acrylic acid polymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble polymers of this type are known materials. Use of polyacrylates of this type in detergent compositions

has been disclosed, for example, in Diehl, U.S. Patent 3,308,067, issued March 7, 1967.

Acrylic/maleic-based copolymers may also be used as a preferred soil suspending polycarboxylic polymer. Such materials include the water-soluble salts of copolymers of acrylic acid and maleic acid. The average molecular weight of such copolymers in the acid form preferably ranges from 2,000 to 100,000, more preferably from 5,000 to 75,000, most preferably from 7,000 to 65,000. The ratio of acrylate to maleate segments in such copolymers will generally range from 30:1 to 1:1, more preferably from 10:1 to 2:1. Water-soluble salts of such acrylic acid/maleic acid copolymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble acrylate/maleate copolymers of this type are known materials which are described in European Patent Application No. 66915, published December 15, 1982. Particularly preferred is a copolymer of maleic / acrylic acid with an average molecular weight of 70,000. Such copolymers are commercially available from BASF under the trade name SOKALAN® CP5.

Other suitable anti-resoiling polymers include those anti-resoiling polymers having: (a) one or more nonionic hydrophile components consisting essentially of (i) polyoxyethylene segments with a degree of polymerization of at least 2, or (ii) oxypropylene or polyoxypropylene segments with a degree of polymerization of from 2 to 10, wherein said hydrophile segment does not encompass any oxypropylene unit unless it is bonded to adjacent moieties at each end by ether linkages, or (iii) a mixture of oxyalkylene units comprising oxyethylene and from 1 to about 30 oxypropylene units wherein said mixture contains a sufficient amount of oxyethylene units such that the hydrophile component has hydrophilicity great enough to increase the hydrophilicity of conventional polyester synthetic fiber surfaces upon deposit of the soil release agent on such surface, said hydrophile segments preferably comprising at least about 25% oxyethylene units and more preferably, especially for such components having about 20 to 30 oxypropylene units, at least about 50% oxyethylene units; or (b) one or more hydrophobe components comprising (i) C₃ oxyalkylene terephthalate segments, wherein, if said hydrophobe components also comprise oxyethylene terephthalate, the ratio of oxyethylene terephthalate: C₃ oxyalkylene terephthalate units is about 2:1 or lower, (ii) C₄-C₆ alkylene or oxy C₄-C₆ alkylene segments, or mixtures therein,

(iii) poly (vinyl ester) segments, preferably polyvinyl acetate), having a degree of polymerization of at least 2, or (iv) C₁-C₄ alkyl ether or C₄ hydroxyalkyl ether substituents, or mixtures therein, wherein said substituents are present in the form of C₁-C₄ alkyl ether or C₄ hydroxyalkyl ether cellulose derivatives, or mixtures therein, and such cellulose derivatives are amphiphilic, whereby they have a sufficient level of C₁-C₄ alkyl ether and/or C₄ hydroxyalkyl ether units to deposit upon conventional polyester synthetic fiber surfaces and retain a sufficient level of hydroxyls, once adhered to such conventional synthetic fiber surface, to increase fiber surface hydrophilicity, or a combination of (a) and (b).

Typically, the polyoxyethylene segments of (a)(i) will have a degree of polymerization of from about 1 to about 200, although higher levels can be used, preferably from 3 to about 150, more preferably from 6 to about 100. Suitable oxy C₄-C₆ alkylene hydrophobe segments include, but are not limited to, end-caps of polymeric soil release agents such as MO₃S(CH₂)_nOCH₂CH₂O-, where M is sodium and n is an integer from 4-6, as disclosed in U.S. Patent 4,721,580, issued January 26, 1988 to Gosselink.

Anti-resoiling polymers useful in the present invention also include cellulosic derivatives such as hydroxyether cellulosic polymers, co-polymeric blocks of ethylene terephthalate or propylene terephthalate with polyethylene oxide or polypropylene oxide terephthalate, and the like. Such anti-resoiling polymers are commercially available and include hydroxyethers of cellulose such as METHOCEL® (Dow). Cellulosic anti-resoiling polymers for use herein also include those selected from the group consisting of C₁-C₄ alkyl and C₄ hydroxyalkyl cellulose; see U.S. Patent 4,000,093, issued December 28, 1976 to Nicol, et al.

Anti-resoiling polymers characterised by poly(vinyl ester) hydrophobe segments include graft co-polymers of poly(vinyl ester), e.g., C₁-C₆ vinyl esters, preferably poly(vinyl acetate) grafted onto polyalkylene oxide backbones, such as polyethylene oxide backbones. See European Patent Application 0 219 048, published April 22, 1987 by Kud, et al. Commercially available anti-resoiling polymers of this kind include the SOKALAN® type of material, e.g., SOKALAN HP-22®, available from BASF.

One type of preferred anti-resoiling polymers is a co-polymer having random blocks of ethylene terephthalate and polyethylene oxide (PEO) terephthalate. The molecular weight of this anti-resoiling polymers is in the range of from about 25,000 to about 55,000. See U.S. Patent 3,959,230 to Hays, issued May 25, 1976 and U.S. Patent 3,893,929 to Basadur issued July 8, 1975.

Another preferred anti-resoiling polymers is a polyester with repeat units of ethylene terephthalate units which contains 10-15% by weight of ethylene terephthalate units together with 90-80% by weight of polyoxyethylene terephthalate units, derived from a polyoxyethylene glycol of average molecular weight 300-5,000. Examples of this polymer include the commercially available material ZELCON 5126® (from Dupont) and MILEASE T® (from ICI). See also U.S. Patent 4,702,857, issued October 27, 1987 to Gosselink.

Another preferred anti-resoiling polymers agent is a sulfonated product of a substantially linear ester oligomer comprised of an oligomeric ester backbone of terephthaloyl and oxyalkyleneoxy repeat units and terminal moieties covalently attached to the backbone. These anti-resoiling polymers are fully described in U.S. Patent 4,968,451, issued November 6, 1990 to J.J. Scheibel and E.P. Gosselink. Other suitable anti-resoiling polymers include the terephthalate polyesters of U.S. Patent 4,711,730, issued December 8, 1987 to Gosselink et al, the anionic end-capped oligomeric esters of U.S. Patent 4,721,580, issued January 26, 1988 to Gosselink, and the block polyester oligomeric compounds of U.S. Patent 4,702,857, issued October 27, 1987 to Gosselink.

Preferred anti-resoiling polymers also include the soil release agents of U.S. Patent 4,877,896, issued October 31, 1989 to Maldonado et al, which discloses anionic, especially sulfoaroyl, end-capped terephthalate esters.

Still another preferred anti-resoiling agent is an oligomer with repeat units of terephthaloyl units, sulfoisoterephthaloyl units, oxyethyleneoxy and oxy-1,2-propylene units. The repeat units form the backbone of the oligomer and are preferably terminated with modified isethionate end-caps. A particularly preferred anti-resoiling agent of this type comprises about one sulfoisophthaloyl unit, 5 terephthaloyl units, oxyethyleneoxy and oxy-1,2-propyleneoxy units in a ratio of from about 1.7 to about 1.8, and two end-cap units of sodium 2-(2-

hydroxyethoxy)-ethanesulfonate. Said anti-resoiling agent also comprises from about 0.5% to about 20%, by weight of the oligomer, of a crystalline-reducing stabilizer, preferably selected from the group consisting of xylene sulfonate, cumene sulfonate, toluene sulfonate, and mixtures thereof. See U.S. Pat. No. 5,415,807, issued May 16, 1995, to Gosselink et al.

The liquid compositions may comprise from 0.01% to 10%, preferably from 0.01% to 5%, and more preferably from 0.05% to 2% by weight of the total composition of a further anti-resoiling agent.

A preferred anti-resoiling agent is an anti-resoiling polymer. A more preferred anti-resoiling agent is a poly (vinyl methyl ether / maleic acid) copolymer, a soil suspending polyamine polymer, a poly vinyl pyridine-N-oxide polymer or a mixture thereof. An even more preferred anti-resoiling agent is a poly (vinyl methyl ether / maleic acid) copolymer, an alkoxyated polyamine polymer, a poly vinyl pyridine-N-oxide polymer or a mixture thereof. The most preferred anti-resoiling agent useful in the compositions herein are selected from the group consisting of : a poly (vinyl methyl ether / maleic acid) copolymer; an ethoxylated polyethylene amine according to the formula as described above wherein $n=2$ and $y=20$; an ethoxylated polyethylene amine according to the formula as described herein wherein $n=40$ and $y=7$; a poly vinyl pyridine-N-oxide polymer; and mixtures thereof.

Other optional ingredients

The compositions herein may further comprise conventional carpet treating ingredients. Preferably, the compositions herein may further comprise a number of additional compounds such as stabilising agents, chelating agents, builder systems, radical scavengers, perfumes, dyes, suds suppressing agents, photobleaching agents, and other minors.

Examples

The following examples will further illustrate the present invention. The compositions are made by combining the listed ingredients in the listed proportions (weight % unless otherwise specified). The following Examples are meant to exemplify compositions used in a process according to the present

invention but are not necessarily used to limit or otherwise define the scope of the present invention.

Example I, heat generation by hydration of substantially anhydrous compounds :

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Compositions (weight %)	IA	IB
	Molecular Sieve UOP 13X® (45%)	water (97%)
	NaHCO ₃ (45%)	Rewopol TS35® (1.5%)
	n-BP (8%)	Syntran 4015® (1.5 %)
	Perfume (2%)	

Molecular Sieve UOP 13X® is an activated zeolite supplied by UOP.

NaHCO₃ is supplied by Solvay.

n-BP is n-butoxy propanol supplied by Union Carbide.

Rewopol TS35® is an anionic surfactant supplied by Witco.

10 Syntran 4015® is a polymer Interpolymer.

Example II, heat generation by acid-base reaction :

Compositions (weight %)	IIA	IIB
	NaOH (1%)	H ₂ SO ₄ (1%)
	Sodium silicate (0.5%)	Hostapur® SAS (1.5%)
	Water (98.5%)	Perfume (0.1%)
		Water (97.3%)

NaOH and H₂SO₄ are supplied by Fluka.

15 Sodium silicate is supplied by Ausimont.

Hostapur® SAS is a C12-C16 paraffin sulphonate supplied by Hoechst.

Example III, heat generation by oxidations or reductions :

Compositions (weight %)	IIIA	IIIB
	Na ₂ SO ₃	H ₂ O ₂
	(50%)	(7%)
	Na ₂ SO ₄	BHT
	(50%)	(0.1%)
		Isofol 12S®
		(1.5%)
		Water
		(91.1%)
		Perfume (0.1%)
		H ₂ SO ₄
		(0.2%)

Na₂SO₃, Na₂SO₄ and H₂SO₄ are supplied by Fluka.

BHT is di-tert-butyl hydroxy toluene supplied by Shell.

- 5 Isofol 12S® is 2-butyl-1-octanol supplied by Condea

Example IV, heat generation by dissolution of an inorganic salt in water :

Compositions (weight %)	IVA	IVB
	AlCl ₃	Crodasinic MS30®
	(20%)	(1.5%)
	Na ₂ SO ₄	Perfume
	(80%)	(0.1%)
		Hexyl CELLOSOLVE®
		(0.5%)
		Water
		(97.9%)

AlCl₃ and Na₂SO₄ are supplied by Fluka.

- 10 Crodasinic MS30® is a N-lauroyl sarcosinate supplied by Croda.

Hexyl CELLOSOLVE® is a solvent supplied by Union Carbide.

- 15 In the above listed Examples I to IV heat is generated by combining the two compositions (A and B) of each example, preferably on a fabric, more preferably on a carpet, in a process according to the present invention.

What is claimed is:

1. A method for determining a value of a function, the method comprising: